African Research Review

An International *Multidisciplinary Journal, Ethiopia*
Vol. 7 (3), Serial No. 30, July, 2013:110-126
ISSN 1994-9057 (Print) ISSN 2070--0083 (Online)
DOI: http://dx.doi.org/10.4314/afrrev.v7i3.9

Assessing the Relationship of Self-regulation, Motivation and Anxiety on Mathematics Achievement of Elementary School Children in South -Western Nigeria

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Abstract

This is a quantitative study investigating the relationship between self – regulated learning, motivation, anxiety and achievement in mathematics. A total of 2,283 elementary pupil, 1,373 (60% female) and 913 (40% male) from selected fifth-sixth year elementary mathematics classrooms in South-western Nigeria participated in the study. Three instruments – a version of the Motivated Strategies for Learning Questionnaire (MSLQ), an adaptation of the Test Anxiety Inventory revised for mathematics (TAI-R-M), and Measure of Academic Performance – were used. Data was analysed using Multiple Regression Correlations. Data analyses revealed that significant contributions are made by self–regulation, motivation and anxiety on

mathematics score of the participants. The results obtained show that mathematics achievement had significant correlations with all the three independent variables (i.e., self-efficacy, motivation, and test anxiety). The results also revealed that mathematics achievement of the participants correlated positively with the three predictor variables. The results of this study also indicate that self –regulation was the most potent contributor to the predictor followed by test anxiety and motivation in that order. The findings underlie the importance of motivation and anxiety for students and how these constructs interact to facilitate self-regulation over the course of developing expertise in a domain, such as mathematics.

Key words: Self-regulation, Motivation, Anxiety, Mathematics achievement, Elementary School Children

Introduction

Psychologist Albert Bandura has defined self-efficacy as one's belief in one's ability to succeed in specific situations. One's sense of self-efficacy can play a major role in how one approaches goals, tasks, and challenges (Luszczynska, Tryburcy, &Schwarzer, 2007). The theory of self-efficacy lies at the centre of Bandura's social cognitive theory which emphasizes the role of observational learning and social experience in the development of personality. The main concept in social cognitive theory is that an individual's actions and reactions, including social behaviours and cognitive processes, in almost every situation are influenced by the actions that the individual has observed in others. Because self-efficacy is developed from external experiences and self-perception is influential in determining the outcome of many events, it is an important aspect of social cognitive theory. Self-efficacy represents the personal perception of external social factors (Grahama, 2011). According to Bandura's theory, people with high self-efficacy—that is, those who believe they can perform well—are more likely to view difficult tasks as something to be mastered rather than something to be avoided. Social learning theory describes the acquisition of skills that are developed exclusively or primarily within a social group. Social learning depends on how individuals either succeed or fail at dynamic interactions within groups, and promotes the development of individual emotional and practical skills as well as accurate perception of self and acceptance of others (Rushi 2007). According to this theory, people learn from one another through observation, imitation, and modelling. Self-efficacy reflects an

individual's understanding of what skills he/she can offer in a group setting (Ormrod, 2006).

Zimmerman and Martinez-Pons (1990) proposed a model to explain self-regulated academic learning based on Bandura's triadic theory of social cognition. It was suggested that students' efforts to regulate their learning involve three classes of determinants: personal processes, environment, and behaviour. It was noted that students' self-efficacy perceptions were related to self-monitoring and academic motivation and achievement. Overall, students used strategies associated with self-perceptions of mathematics and verbal efficacy to regulate their learning. They also displayed greater insight of efficacy and use of learning strategies as they advanced in school. Students' perceptions of academic efficacy increased during junior high school years. Further, gifted students displayed higher levels of self-efficacy, as well as made greater use of learning strategies designed to regulate personal process, behaviour functions and environmental events.

Self-efficacy is the measure of one's own ability to complete tasks and reach goals (Rushi, 2007). Psychologists have studied self-efficacy from several perspectives, noting various paths in the development of self-efficacy; the dynamics of self-efficacy, and lack thereof, in different settings; interactions between self-efficacy and self-concept; and habits of attribution that contribute to, or detract from, self-efficacy.

Self-efficacy affects every area of human endeavour. By determining the beliefs a person holds regarding his or her power to affect situations, it strongly influences both the power a person actually has to face challenges competently and the choices a person is most likely to make. These effects are particularly apparent, and compelling, with regard to behaviours affecting health (Schwarzer &Hallum 2008). Jimenez Saffa (2006) argued the concepts of locus of control, neuroticism, self-efficacy and self-esteem measured the same, single factor and demonstrated them to be related concepts (Lippke,Weidemann, Ziegelmann, Reuter &Schwarzer, 2009).

Wolters and Pintrich (1998) assessed differences in students' task values, self-efficacy, test anxiety, cognitive strategy uses, regulatory strategy uses, and classroom academic performances across the subject areas of mathematics, social studies, and English. Results suggested that to some degree the motivational aspects of self-regulated learning are context specific. Furthermore, the authors suggested that the level of self-regulated learning in terms of strategy use varied as a function of subject area

differences in classroom context. Additional research (e.g., Pintrich & De Groot, 1990; Pintrich, Roser & De Groot, 1994 .;Sue, David, Derald wing, &Stanley 2006) suggested that students who valued and were interested in the content of the subject area were more likely to report using more self-regulatory strategies.

Meece, Wigfield, and Eccles (1990) draw on expectancy-value and self-efficacy theories of achievement motivation to identify predictors of mathematics anxiety on young adolescents' enrolment and performance in mathematics. The authors assessed the influence of past mathematics grades, mathematics ability perceptions, performance expectancies, and value perceptions on the level of mathematics anxiety. Considering predictors of mathematics anxiety, the principles of mathematics are generally understood at an early age; preschoolers can comprehend the majority of principles underlying counting. By kindergarten, it is common for children to use counting in a more sophisticated manner by adding and subtracting numbers. While kindergarteners tend to use their fingers to count, this habit is soon abandoned and replaced with a more refined and efficient strategy; children begin to perform addition and subtraction mentally at approximately six years of age. When children reach approximately eight years of age, they can retrieve answers to mathematical equations from memory. With proper instruction, normally functioning children acquire these basic mathematic skills, and are able to solve more complex mathematical problems with more sophisticated training (Kail & Zolner, 2005, Schwarzer, 2008).

High risk teaching styles are often explored to gain a better understanding of math anxiety. Dormann, Fay, Dapf and Frese (2006) suggested that there are linkages between a teacher's lack of subject knowledge and ability to effectively plan teaching material. These findings suggest that teachers that do not have a sufficient background in mathematics may struggle with the development of comprehensive lesson plans for their students. Similarly, Cornner's research (2005) shows that teachers with certification in maths are more likely to be passionate and committed about teaching maths than those without certification. However, those without certification vary in their commitment to the profession depending on coursework preparation.

Moreover, a study conducted by Renner, Kwon, Yang, Paik, Kim, Roh, Song, &Schwarzer (2008) they examined attitudes towards maths and behaviour during maths examinations. The study examined the effect of extensive training in teaching women to approach maths. The results showed

that women that were trained to approach rather than avoid maths showed a positive implicit attitude towards maths. These findings were only consistent with women low in initial identification with maths. This study was replicated with women either encouraged to approach maths or received neutral training. Results were consistent and demonstrated that women taught to approach maths had an implicit positive attitude and completed more maths problems than women taught to approach math in a neutral manner.

Luszczynska,&Schwarzer (2005) conducted a study in which they examined the effect of teaching stereotype threat as a means of improving women's math performance. The researchers concluded from the study's results that women tended to perform worse than men when problems were described as math equations. However, women did not differ from men in a condition with a test sequence described as problem solving or in a condition in which they learned about stereotype threats. This research has practical implications; educating female teachers about stereotype threat can reduce its negative effects in the classroom. The results indicated that students' current performance expectancies in mathematics and, to a somewhat lesser extent, the perceived importance of mathematics have the strongest direct effects on their anxiety. Results also suggested that efficacy-related judgments significantly predict mathematics anxiety in students and students' perceptions of their mathematics ability mediate the effects of past performance on anxiety. However, the importance students assigned to mathematics achievement did not hinder the effects of expectancies on anxiety. Therefore, students who assigned more importance to achievement in mathematics reported less mathematics anxiety.

Attribution, or causal attribution, is sometimes defined as an individual's perception of the causes of his or her own success or failure. In other words, it is the inference that an individual makes about the results of behaviour. There are four perceived causes of success and failure in achievement situations: ability, effort, task difficulty, and luck. Attribution has been found to influence self-efficacy as well as be apparent among success-oriented and failure-avoiding students. Success-oriented students were believed to be able to handle academic challenges, while failure-avoiding students were believed to relate failure to lack of proper effort. Research has shown that those students who have high internal control are better managers of their study time, their study environment, and their actual effort when faced with boring tasks (Schwarzer, 2008).

How self-efficacy affects human function

Choices regarding behaviour

People generally avoid tasks where self-efficacy is low, but undertake tasks where self-efficacy is high. Self-efficacy significantly beyond actual ability leads to overestimation of the ability to complete tasks. On the other hand, self-efficacy significantly lower than ability discourages growth and skill development. Research shows that the optimum level of self-efficacy is slightly above ability; in this situation, people are most encouraged to tackle challenging tasks and gain experience (Bandura, 2008).

Motivation

High self-efficacy can affect motivation in both positive and negative ways. In general, people with high self-efficacy are more likely to make efforts to complete a task, and to persist longer in those efforts, than those with low self-efficacy (Schwarzer, 2008). The stronger the self-efficacy or mastery expectations, the more active the efficacy (Rodebaugh 2006). However, those with low self-efficacy sometimes experience incentive to learn more about an unfamiliar subject, where someone with a high self-efficacy may not prepare as well for a task.

Thought patterns & responses

Self-efficacy has several effects on thought patterns and responses:

- Low self-efficacy can lead people to believe tasks to be harder than they actually are (Schwarzer 2008). This often results in poor task planning, as well as increased stress.
- People become erratic and unpredictable when engaging in a task in which they have low self-efficacy.
- People with high self-efficacy tend to take a wider view of a task in order to determine the best plan.

Obstacles often stimulate people with high self-efficacy to greater efforts, where someone with low self-efficacy will tend toward discouragement and giving up. Academic self-efficacy refers to the belief that one can successfully engage in and complete course-specific academic tasks, such as accomplishing course aims, satisfactorily completing assignments, achieving a passing grade, and meeting the requirements to continue to pursue one's major course of study (Pajares &Urdan 2006). Various empirical inquiries

have been aimed at measuring academic self-efficacy (Guitierres–Dona, Lippke, Renner, Kwon & Schwarzer 2009).

A person with high self-efficacy will attribute failure to external factors, while a person with low self-efficacy will blame low ability. For example, someone with high self-efficacy in regards to mathematics may attribute a poor test grade to a harder-than-usual test, illness, lack of effort, or insufficient preparation. A person with a low self-efficacy will attribute the result to poor mathematical ability. Thus, the present study sought to examine whether self-regulation, motivation and anxiety contribute to mathematics achievement among pupils in elementary schools in their fifth and sixth years.

Purpose of the study

The purpose of the present study was to gather information from fifth- and sixth year elementary pupils regarding their self-regulation, motivation, anxiety and academic achievement in their mathematics classroom. More specifically, this study will provide information assessing the relationships between self-regulated learning, motivation, anxiety, and academic achievement in mathematics for fifth and sixth year elementary school learners. Information from this study will assist in designing learning environments to assist teachers in producing learners with moderate anxiety and students in becoming academically successful learners in mathematics.

Research questions

Three research questions guided this study:

RQ1; Are there significant relationships among the independent variables (self-regulation, motivation and test anxiety) and dependent variable (achievement in mathematics) among elementary school pupils?

RQ2: What is the composite contribution of the independent variables to the dependent variable?

RQ3: What is the relative contribution of the independent variables to the dependent variable (mathematics achievement)?

Method

Design: Quantitative research design was adopted for this study.

Participants: The participants in this study were fifth and sixth year elementary pupils (N=2283) in mathematics classroom. Group 1 consisted of 959 fifth year and group 2 consisted of 1,324 sixth year pupils. Of the

participants, 60% were female and 40% were male; 21% were Igbo, 69% were Yoruba while 10% were Hausas (The Igbo, Yoruba and Hausa are the three major ethnic groups in Nigeria).

Instruments: Three instruments, a version of the Motivated Strategies for Learning Questionnaire (MSLQ) previously used with seventh graders (Pintrich & De Groot, 1990), an adaptation of the Test Anxiety Inventory revised for mathematics (TAI-R-M; Spielberger et al., 1980), and Measure of Academic Performance were administered to different groups of fifth- and sixth year elementary pupils. The participants were given parental consent forms to take home and return signed. Those who returned a signed consent form were allowed to participate. Each participant read the purpose of the study and then completed the packet of instruments during two 90 minute class periods during the first term, 2010/2011 academic session.

Four constructs were derived from variables or items on the survey and explored in this study: (1) self-regulated learning, (2) motivation, and (3) test anxiety. The construct of self-regulated learning was drawn from subscales of cognitive strategies (CogStrag) and self-regulation (SelfReg) from the version of the MSLQ. The construct of motivation was defined using the subscales of intrinsic motivation (IntMot) and self-efficacy (SelfEff) from the MSLQ. Test anxiety was defined using the subscale of test anxiety (TstAnx) from the MSLQ and using two subscales from the TAI-R-M. These two subscales included emotionality and worry. The construct of attribution was defined using the success and failure subscales.

Motivated Strategies for Learning Questionnaire (MSLQ)
The adapted version of the MSLQ is a self-report questionnaire that included 38 items constructed to gather information on student motivation, cognitive strategy use, metacognitive strategy use and management of efforts. Pupils were instructed to respond to the items on a 5-point Likert scale (1 = almost never to 5 = almost always) in terms of their behaviour in the mathematics class. Items were adapted from the MSLQ (Pintrich & De Groot, 1990).

Results of the factor analysis led to the adapted version of the MSLQ consisting of five scales that included the Self-Efficacy scale, the Intrinsic Value scale, the Test Anxiety scale, the Cognitive Strategy Use scale, and the Self-Regulation scale. The Self-Efficacy scale ([alpha] = .89, Pintrich & De Groot) consisted of nine items relevant to perceived competence and confidence in performance of class work, specifically in mathematics. The

Intrinsic Value scale ([alpha] = .87, Pintrich & De Groot) was constructed by taking the mean score of the student's response to eight items concerning intrinsic interest in perceived importance of course work as well as preference for challenge and mastery goals. The Test Anxiety scale was constructed using four items regarding worry on tests and cognitive inference on tests ([alpha] = .75, Pintrich & De Groot). Using ten items, the Cognitive Strategy Use scale ([alpha] = .83, Pintrich & De Groot) assessed the use of rehearsal strategies, elaboration strategies such as summarizing and paraphrasing, and organizational strategies. The Self-Regulation scale ([alpha] = .74, Pintrich & De Groot) was constructed from seven items pertaining to metacognitive and management such as planning, skimming, and comprehension monitoring and students' persistence at difficult/boring tasks and working diligently.

The survey instrument for this study yields a total score based on the sum of all 38 items, a score for Self-Efficacy scale (9 items), a score for Intrinsic Value (8-items), a score for Test Anxiety (4-items), a score for Cognitive Strategy Use (10-items), and a score for Self-Regulation (7-items). Sample specific reliability estimates for the five MSLQ scales used in this study were examined using Cronbach's and compared to those reliabilities cited by the original developers of the instrument (Midgley et al., 1997; Pintrich & De Groot, 1990). The reliability estimates for self-efficacy, intrinsic value, test anxiety, cognitive strategy use, and self-regulation were .69, .81, .87, .77, and .77, respectively.

Test Anxiety Inventory-Revised-Mathematics (TAI-R-M)

This survey instrument was constructed to gather information about students and their experiences while taking tests in mathematics. The questions included were Likert-scale (1= almost never to 4= almost always) items and were designed to measure differences in individuals' test anxiety as a situation-specific personality trait (Spielberger et al., 1980). The Test Anxiety Inventory-Revised-Mathematics yields an overall score on mathematics test anxiety and two subscale scores. The subscale scores were designed to measure emotionality and worry, which are two reactions evoked by tests (Gieri & Rogers, 1996). Emotionality is defined as "reactions of the autonomic nervous system that are evoked by evaluative stress" and worry is "cognitive concerns about the consequences of failure". Students were asked to respond to 20 statements about anxiety reactions that may occur before, during, or after taking a mathematics test. The survey instrument yielded a

total score based on the sum of all 20 items, a score for emotionality based on an 8-item subscale, and a score for worry based on a different 8-item subscale.

The validity and reliability of the Test Anxiety Inventory (TAI) were reported by reviews (Galassi, 1995) in the Mental Measurements Yearbook. With regards to validity, the TAI was highly correlated with several different anxiety self-report measures (e.g., Sarason's Test Anxiety Scale (TAS), Liebert & Morris' Worry and Emotionality Questionnaire, Bakare Test Anxiety Scale (BTAS), Student Academic Stress Scale (SASS) and the State and Trait Anxiety Scales). The correlation between the TAI and the TAS ranged from .85 to .86. However, the discriminant validity for the emotionality and worry scales did not appear to be well established. With respect to reliability, internal consistency coefficients for emotionality, worry, and total TAI scores were .87-.93, .835-.92, and .93-.97, respectively. Test-retest reliability coefficients of .81 were reported for the TAI scores.

Further, for the present study content and face validity was established for the TAI-R-M by the researcher and four committee members reviewing scale items. Items that had to be revised were then updated and returned to the expert panel for a second review. Those items, the members of the panel selected, were included in the final instrument. In addition, Cronbach's alpha coefficient for internal reliability of the TAI-R-M scores and the scores for the subscales (emotionality and worry) for this study were determined. The reliability coefficients for the emotionality, worry, and other subscales were .89, .87, and .75, respectively.

Academic performance

Academic performance was measured by collecting data on pupils' performance in their current mathematics classroom. In addition, each participant completed a 20 problem, teacher-made achievement mathematics test which was constructed in alignment with the Universal Basic Education Curriculum. These test items were selected based on the assumption that the Universal Basic Education Curriculum, in agreement with the Principles and Standards for School Mathematics suggests that by the end of the fifth year pupils should have mastered these types of mathematics items. The items that were included on the test were selected because they cover material from the content standards that assess number sense, number systems, and number theory; spatial sense, and measurement; probability. In addition, these items

were included because they address mathematical processes (i.e., problem solving, connections, reasoning) and require students to draw upon these processes to solve the test items. Scores for the test were computed by assigning a one for each correct answer and a zero for each incorrect answer, with a total possible score of 20. Cronbach's alpha was used to estimate the internal reliability of the Mathematics Test ([alpha] = .72).

Procedure

Nigeria as a country is sub-divided into six geo-political zones with South-West consisting of six states of the Yorubas – Ekiti, Lagos, Ogun, Ondo, Osun and Oyo state. The target population consisted of 2,283 fifth- and sixth-year elementary pupils currently in elementary schools. The assessable population comprised 30 intact classes. Fifteen of the classes were made up of fifth year pupils and fifteen were made up of sixth year pupils. Fifteen classes were selected on the basis of the teachers' willingness to yield class time to the researcher. The procedure for selecting the schools began by obtaining a list from the Zonal Inspector of Education offices of all schools, within the Capital Towns of chosen States . From this list, those schools located within a 15-km radius of the participating school were selected. By using systematic random sampling, the sample of schools were obtained by selecting one school on a random basis and choosing additional schools at evenly spaced intervals until the desired number was obtained. This resulted in a total of 30 schools that participated in this study.

Each school administrator was mailed packets that included a cover letter, consent forms, surveys, and incentives for participation. After initial review of the packets, the teachers and students were informed about the details of this study and consent forms were given out to the participants to be signed by a parent or guardian. All students who returned a signed consent form were allowed to participate. Each participant read the purpose of the study and then completed the packet of instruments during 40-minute class periods during the first term of 2010/2011 session.

Data analysis

Multiple regression correlations were performed in order to assess the relationships between the independent variables (self-regulated learning, motivation and anxiety in mathematics,) and the dependent variable (mathematics achievement as measured by test score and math grade) for elementary school children. Correlation coefficients were obtained for each

of the factors of self-regulated learning, motivation and anxiety in mathematics with each of the two academic dimensions.

Results

Table 1: Summary of Test of Significant Correlations among Independent Variables and Mathematics Achievement Scores of the Respondents

Variable	1	2	3	4	5
Self -regulation	1.000				
Motivation	0.733**	1.00			
Test anxiety	0.407**	0.235**	1.000		
Maths achievement	0.370**	0.204**	0.307**	0.149**	1.000
Mean	39.35	35.36	29.48	22.51	25.48
Standard deviation	3.12	1.91	4.06	5.39	3.93

Correlation significant at x =0.01

Correlation significant at x =0.05

The result from table 1 showed that Mathematics achievement had significant correlations with all the three independent variables viz; self-regulated learning ($r=0.370$, $p<0.01$), motivation ($r= 0 .204$, $p<0.01$) and anxiety ($r=0.307$, $p<0.01$). It is the interest of the researcher to investigate whether self-regulation, motivation, and test anxiety would significantly predict mathematics achievement of the elementary school pupils. To accomplish the laudable objective of the study, multiple regression analysis was resorted, mathematics achievement as a dependent variable was regressed on self-regulation, motivation and test anxiety as independent variables

RQ2: What is the composite contribution of the independent variables to the dependent variables?

Table 2: Summary of regression analysis of the combined prediction of mathematics achievement by the three independent variables

R	R square	Adjusted R square	Std error of the est
0.416	0.713	0.166	5.46531

Analysis of Variance

	Sum of square	Df	Mean square	F	P	Remark
Regression	3089.28	4	772.32	25.86	0.000	Sig
Residual	14785.48	495	29.87			
Total	1784.76	499				

Table 2 shows the prediction of all the three independent variables to the dependent variable. That is the mathematics achievement of the elementary school pupils correlated positively with the three predictor variables. The table also shows a coefficient of multiple correlations (R) of 0. 416, and a multiple R square of 0.173. This indicates that 17.3% of variance in mathematics achievement of elementary school pupils was accounted for by the three predictor variables when taken together. The significance of the composite contribution was tested at $p< 0.05$ using the F- ratio at the degree of freedom (df= 4.495). The table also shows that the analysis of variance for the regression yielded F – ratio of 25.856 (significant at 0.01 level). This implies that the joint contribution of the independent variables to the dependent variable was significant and that other variables not included in this model may have accounted for the remaining variance.

RQ3: What is the relative contribution of the independent variables to the dependent variable (mathematics achievement)?

Table 3: Relative contribution of the independent variables to the dependent variable (test of significance of the regression coefficient)

Variable	Unstandardized coff.		Standardized coeff.			
	B	Std Error	Beta	t	P	Remark
Constant	45.50	3.02		15.07	0.000	Sig
Self regulation	1.40	0.24	0.39	5.96	0.00	Sig
Motivation	0.26	0.13	0.12	1.97	0.05	Sig
Test anxiety	0.81	0.21	0.18	3.94	0.00	Sig

Table 3 reveals the relative contribution of the three independent variables to the dependent variables expressed as regression weights. The positive value of the effects of self-regulation, motivation and test anxiety implies that the mathematics achievement of elementary school pupils is actually determined by positive reinforcement of these three variables. Using the unstandardized regression coefficients to determine the relative contributions of the independent variables to the explanation of the dependent variable of self-regulation (B= 1.40, t=5.96, $p<0.05$) is the most potent contributor to the prediction followed by test anxiety (B = 0.81, t = 3.94, $p<0.05$) and motivation (B = 0.264, t = 1. 97, $p<0. 05$) in that order. In a nutshell, the mathematics achievement of elementary school pupils are determined by the three variables as arranged above in order in which they contributed to the mathematics achievement of elementary school pupils.

Discussion

Relationships were observed between motivation, anxiety and test score for elementary school learners in mathematics. More specifically, relationships emerged between self-efficacy, motivation, test anxiety, and math grade for the elementary school pupils. This finding is significant in that it allows students, teachers, and parents to see how academic achievement is affected by such factors as self-efficacy, motivation and anxiety. Hence, it requires conducive for learning environments in order to assist teachers in producing students in becoming academically successful learners in mathematics.

Mainly, relationships exist between self-efficacy, motivation, anxiety, and academic performance, as measured by mathematics grade, for the elementary school pupils in mathematics. Much of the literature documents the fact that students who are more self-regulated tend to be higher academic achievers. In this study is in line with the past literature most of which observed of self-regulation (i.e., self-regulation and cognitive strategy used) were significantly related to academic performance the learners in mathematics. Also, motivation and anxiety were found to be significantly related to academic performance. It follows that, teachers and students need to work together to develop a learning environment in which assessment could be positively influenced by these constructs. Motivation has been found to greatly affect the classroom by influencing both learning and performance of students. According to Meece, Wigfield, and Eccles (1990), efficacy-related judgments significantly predict mathematics anxiety in students and students' perceptions of their mathematics ability mediate the

effects of past performance on anxiety (Schwarzer, 2008; Gutierrez –Dona, Lippke, Renner, Kwon Schwarzer, 2009). Consequences of attributions are pertinent to motivation within the classroom and have also been found to influence self-efficacy as well as be apparent among success-oriented and failure-avoiding students.

It was revealed in this study that self-regulation was the most potent contributor to the prediction of mathematics achievement. This result corroborates the findings of other researches and has also shown that students with high self-efficacy outperform students with low self-efficacy in the completion of mathematics problems and that self-efficacy, more so than anxiety, accounts for large portions of the variance in mathematics performance. It is also possible that motivation affects school grades because students are given the opportunity to engage in motivational behaviours (e.g., persistence, extra credit) that may affect grades (Gottfried, 1990, Luszczynska &Schwarzer, 2005; Rushi, 2007; Schwarzer &Hallum 2008).

Another factor that has been found to affect school grades is anxiety. Considerable evidence indicates that students who report high anxiety in achievement situations perform poorly compared to students who report relatively low anxiety (Pintrich & DeGroot, 1990; Everson, Smodlaka, & Tobias, 1994; Busari 2000). Anxiety interferes with learning and with demonstration of understanding, and those students who are not well prepared or who expect to fail are more likely to have higher anxiety than those students who are well prepared and expect to succeed (Busari & Osiki, 2002; Pajares & Urdan, 2006; Jimenez Soffa 2006, Albert Bandura 2008).

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